



SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

Certificate of Calibration

Submitted By: DIV20

Address: B57

Contact: DARRELL DUNN

Manufacturer Model: DURO-SENSE TYPE K

Description: THERMOCOUPLE

Serial No: 334

Asset No: 008428

Procedure: CUSTOMER PROCEDURE DATED 11/16/01

Work Order: 444050665

Date Issued: Oct 24, 2002

Calibration Date: Oct 23, 2002

****Calibration Due:** Apr 23, 2003

Calibration Location: N/A

Environment: Temp. 75.0°F Hum. 51 %RH

***As Found:** SEE ATTACHED DATA

***As Left:** SEE ATTACHED DATA

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCCL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of $k=2$ to approximate a 95% confidence level. The calibration process provides a Test Uncertainty Ratio (TUR) of less than or equal to 25% (4:1) of the test limit unless otherwise stated in remarks or an attachment.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: SEE ATTACHED DATA

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
009137	HART SCIENTIFIC, INC	1575	THERMOMETER	Dec 10, 02
008920	HART SCIENTIFIC, INC	17660-A-120-6-W	PLATINUM RTD	Dec 07, 02

Approved by: Walt Hill

Metrology Group Leader

m:\Non21a1.rpt Rev date 15, August 02

Measurements by: Vince Morales

Metrology Technician

Southwest Research Institute
Calibration Laboratory
Calibration Data Sheet

Work Order 444050665	Mfr. Duro-Sense	Technician V Morales	
Asset #. 8428	Model Type K	Procedure Customer	
Serial #. 334	Type Tehrmocouple	Cal Date 23-Oct-02	
Remarks: Customer wants readings per letter dated Nov 16, 2001 Readings are provided without regard to "Pass"or"Fail".It is up to the user to determine if the readings meet their requirements.			

Test Point	Standard Read	TI Read	Difference	Test Limits +/-	Uncertainty	Found/Left
Degree C	Degree C	Degree C	Degree C	Degree C	Degree C	
0	0.01	0.0	0.00		0.35	
150	149.99	150.9	-0.91		0.35	



SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692

Certificate of Calibration

Submitted By: DIV20

Address: B57

Contact: DARRELL DUNN

Manufacturer Model: DURO-SENSE TYPE K

Description: THERMOCOUPLE

Serial No: 334

Asset No: 008428

Procedure: CUSTOMER MEMO, NOV/00

Work Order: 444053505

Date Issued: May 1, 2003

Calibration Date: May 1, 2003

****Calibration Due:** Nov 1, 2003

Calibration Location: Bldg. 64

Environment: Temp. 75.0°F Hum. 48 %RH

***As Found:** IN TOLERANCE

***As Left:** IN TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCSL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of $k=2$ to approximate a 95% confidence level. The calibration process provides a Test Uncertainty Ratio (TUR) of less than or equal to 25% (4:1) of the test limit unless otherwise stated in remarks or an attachment.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: TEST POINTS AND PROCEDURE COMPLY WITH CUSTODIAN MEMO DATED NOV. 16, 2000.

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
008920	HART SCIENTIFIC, INC	17660-A-120-6-W	PLATINUM RTD	Jul 06, 03
009137	HART SCIENTIFIC, INC	1575	THERMOMETER	Jul 06, 03
005325	XITRON TECHNOLOGIES	2000M	V/A/T CALIBRATOR	Oct 30, 03

Approved by: Walt Hill
Metrology Group Leader
m\Nona21a1.rpt Rev date 15, August 02

Measurements by: Mark Romero
Metrology Technician

Southwest Research Institute
 Calibration Laboratory
 Calibration Data Sheet

Work Order	444053505	Mfr.	Duro-Sense		Technician	Mark A. Romero
Asset #.	008428	Model	Type	K		
Serial #.	334	Type	Thermocouple		Cal Date	1-May-03
Remarks:	Test points and procedure comply with custodian memo dated Nov. 16, 2000.					
Accuracy comply with IEC 584-2 (1982)						

Function/Range	Test Point	TI Read	Difference	Test Limits +/-	Uncertainty	Found/Left
mV	Deg C	Deg C	Deg C	Deg C	Deg C	
0.00	0.08	-0.01	0.09	1.50	0.26	Pass
6.16	150.04	150.58	-0.54	1.50	0.27	Pass

END OF REPORT



SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692



Certificate of Calibration

0972-01

Submitted By: DIV20
Address: B57
Contact: DARRELL DUNN
Manufacturer Model: DURO-SENSE TYPE K
Description: THERMOCOUPLE
Serial No: 334
Asset No: 008428
Procedure: CUSTOMER MEMO, NOV/00

Work Order: 444056987
Date Issued: Jan 26, 2004
Calibration Date: Jan 22, 2004
****Calibration Due:** Jul 22, 2004
Calibration Location: Bldg. 64
Environment: Temp. 76.0°F Hum. 45 %RH
***As Found:** IN TOLERANCE
***As Left:** IN TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCCL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. The calibration process provides a Test Uncertainty Ratio (TUR) of less than or equal to 25% (4:1) of the test limit unless otherwise stated in remarks or an attachment.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
009137	HART SCIENTIFIC, INC	1575	THERMOMETER	Feb 05, 04
008920	HART SCIENTIFIC, INC	5614-17660-A-12	PLATINUM RTD	Feb 07, 04
005325	XITRON TECHNOLOGIES	2000M	V/A/T CALIBRATOR	Nov 13, 04

Approved by: Walt Hill
Metrology Group Leader

Measurements by: Mark Romero
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Calibration Report

Work Order:	444056987	Mfr.	Duro-Sense		Technician	Mark Romero
Asset No:	008428	Model	Type	K	Cal Date	22-Jan-04
Serial No:	334	Type	Thermocouple			
Remarks: Limits taken from ASTM E230-02 and are based on brand new unused thermocouples.						

Function/Range	Test Point	TI Read	Difference	+/-Limit	+/-Uncertainty	Found/Left
mV	Deg C	Deg C	Deg C	Deg C	Deg C	Result
0.01	0.09	0.33	-0.24	2.20	0.03	Pass
6.16	150.03	150.57	-0.54	2.20	0.03	Pass

END OF REPORT



SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692



Certificate of Calibration

0972-01

Submitted By: DIV20

Address: B57

Contact: DARRELL DUNN

Manufacturer Model: DURO-SENSE TYPE K

Description: THERMOCOUPLE

Serial No: 334

Asset No: 008428

Procedure: CUSTOMER LETTER DATED NOV 16, 2000

Work Order: 444059857

Date Issued: Jul 20, 2004

Calibration Date: Jul 20, 2004

****Calibration Due:** Jan 20, 2005

Calibration Location: Bldg. 64

Environment: Temp. 77.0°F Hum. 44 %RH

***As Found:** IN TOLERANCE

***As Left:** IN TOLERANCE

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCCL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. See Remarks or attached Calibration Report with the same Work Order number for calibration data.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: None

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
009137	HART SCIENTIFIC	1575	THERMOMETER	Sep 05, 04
008920	HART SCIENTIFIC	5614-17660-A-12	PLATINUM RTD	Sep 09, 04
005325	XITRON TECHNOLOGIES	2000M	V/A/T CALIBRATOR	Nov 13, 04

Approved by: Walt Hill
Metrology Group Leader
m:\a2la1.rpt Rev date 11, May 04

Measurements by: Mark Romero
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	444059857	Mfr.	Duro-Sense	Technician	Mark Romero
Asset No:	008428	Model	Type K		
Serial No:	334	Type	Thermocouple	Cal Date	20-Jul-04
Remarks: Limits taken from ASTM E230-02 and are based on brand new unused thermocouples. Verification complies with customer memo dated Nov. 16, 2000.					

Function/Range	Test Point	TI Read	Difference	+/-Limit	+/-Uncertainty	Found/Left
mV	Deg C	Deg C	Deg C	Deg C	Deg C	Result
0.01	0.10	0.16	-0.06	2.20	0.028	Pass
6.15	150.05	150.20	-0.15	2.20	0.028	Pass
END OF REPORT						



SOUTHWEST RESEARCH INSTITUTE™

6220 Culebra Road, P.O. Drawer 28510
Institute Quality Systems
Institute Calibration Laboratory
Phone: 210-522-5215 Fax 210-522-3692



Certificate of Calibration

0972-01

Submitted By: DIV20
Address: B57
Contact: DARRELL DUNN
Manufacturer Model: DURO-SENSE TYPE K
Description: THERMOCOUPLE
Serial No: 334
Asset No: 008428
Procedure: THERMOCOUPLE GENERAL, JAN/03

Work Order: 303063519
Date Issued: Apr 11, 2005
Calibration Date: Apr 6, 2005
****Calibration Due:** Oct 6, 2005
Calibration Location: Bldg. 64
Environment: Temp. 73.0°F Hum. 40 %RH
***As Found:** SEE ATTACHED DATA
***As Left:** SEE ATTACHED DATA

This certificate documents traceability to the National Institute of Standards and Technology (NIST) and the International System of Units (SI). The Laboratory quality system conforms to ISO/IEC 17025, 1999 and ANSI/NCSL Z540-1-1994 which are equivalent to relevant requirements of the ISO 9000-1994 series of standards. This certificate may not be reproduced, except in full, without the written approval of the Southwest Research Institute Calibration Laboratory. The results of this calibration relate only to the individual instrument described above. This certificate shall not be used to claim product endorsement by the American Association for Laboratory Accreditation (A2LA) or any agency of the U. S. Government.

Uncertainty evaluation includes the item under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor of k=2 to approximate a 95% confidence level. See Remarks or attached Calibration Report with the same Work Order number for calibration data.

*The client has sole responsibility for determination of in/out of tolerance or compliance/noncompliance. An in/out of tolerance opinion is provided for your convenience based only on the Test Instrument (TI) reading(s) and limits as reported. The reported uncertainty relates only to the results at the time of calibration and does not imply any short or long term stability of the TI.

**Calibration interval is determined by the client and does not assure the instrument will remain within tolerance until this date. Any number of factors may cause the instrument to be out of tolerance before the next calibration date.

Remarks: Calibrated at 0.0 and 150 Degrees C

Standards Used

Asset	Manufacturer	Model	Description	Cal Due
009137	HART SCIENTIFIC	1575	THERMOMETER	May 21, 05
010281	HART SCIENTIFIC	5628	SPRT	Jun 24, 08
010329	FLUKE	525A	TEMPERATURE/PRESSURE CALIBRATOR	Sep 24, 05

Approved by: Walt Hill
Metrology Group Leader

m:\a2la1.rpt Rev date 11, May 04

Measurements by: Bob Trollinger
Metrology Technician

Southwest Research Institute
Calibration Laboratory
Measurement Report

Work Order:	303063519	Mfr.	Omega	Technician	blt
Asset No:	008428	Model	Type K	Cal Date	6-Apr-05
Serial No:	334	Type	Thermocouple		
Remarks: Limits taken from ASTM E230-02 and are based on brand new unused thermocouples.					
Limited Cal - tested at 0.0 and 150 C					

Function/Range	Test Point	TI Read	Difference	+/-Limit	+/-Uncertainty	Found/Left
	° C	° C	° C	° C	° C	Result
	0.065	0.06	0.00	2.2	0.19	Pass
	150.05	151.32	-1.27	2.2	0.30	Pass
END OF REPORT						